

# Summative Assessment #1 for Statistical Sleuths



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**Summative Assessment #1**  
**Detective Diary (final entry)**  
 Constructed Response

Duration: **30-40 minutes**

Standard(s) Assessed:

MA.E.3.3.1.8.1, MA.E.3.3.1.8.3, MA.E.3.3.2.8.3, MA.E.1.3.1.8.2, MA.E.1.3.2.8.1,  
 MA.E.1.3.1.8.1, MA.E.1.3.2.8.3, MA.E.3.3.2.8.4

Description of Assessment Activity:

Throughout the unit, students (a.k.a. detectives) made entries in their Detective Diaries about the clues they discover while collecting and analyzing different sets of data. At the end of the unit, students are presented with a problem, then formulate and design an experiment to test their hypothesis. They then review another hypothesis, assert the reasons why they agree with the hypothesis, and if they disagree, explain their position. Students also identify the type of sampling technique that was used to verify the hypothesis based on the data. Next, students use scores to create a box-and-whisker graph and find the mean, median, and mode. Students also explain how a box-and-whisker graph is used to interpret measures of central tendency. Finally students look at a histogram and read and interpret the data.

\*Source: Adapted from open-response released items (1991-1990). Kentucky Instructional Results Information System. Kentucky Department of Education.

**Teacher Directions:**

1. Provide a copy of the final Detective Diary (summative) entry for each student (page 7).
2. Ask students if they have any questions about the activity.
3. Provide additional assistance if students appear to be having any difficulties.
4. This diary entry serves as a cumulative assessment piece for the unit. The Scoring Checklist provided should allow the teacher to measure the student's comprehension of the GLEs designated for this activity. If a student does not mastery a section of this activity, then re-teaching might be necessary for student achievement.

**Student Directions:**

1. Respond to each question completely.
2. Turn in Summative Assessment #2 when finished with diary entry.

**Scoring Method & Criteria:**

Use the Scoring Criteria for Summative Assessment #1 and the Long-Answer Question Rubric to evaluate student work. (See Unit Plan associated file.)

## Scoring Criteria for Summative Assessment #1

Use the Long-Answer Question Rubric to assess the thoroughness of each description. (See Unit Plan associated file.)

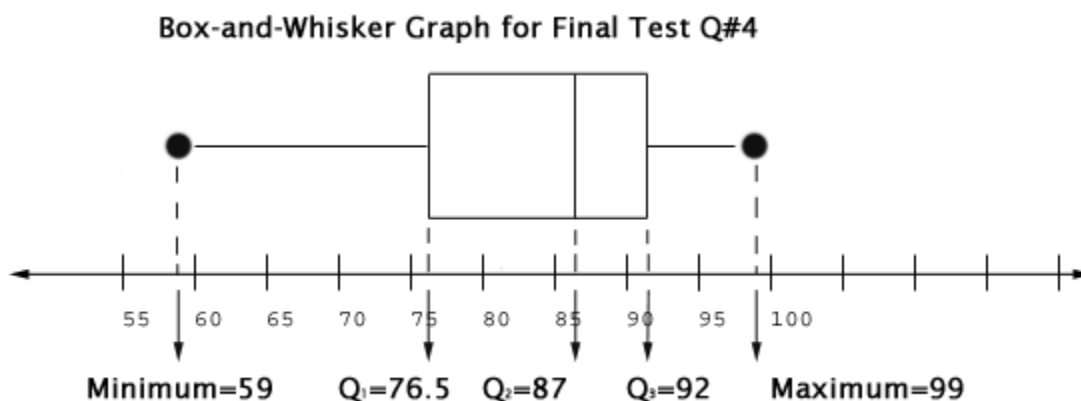
1. The student's hypothesis needs to be in response to the question: How much time would be sufficient for the average eighth grade student to spend doing math homework per week? (Keep in mind that students must maintain a B average or higher.) The hypothesis should contain a persuasion to their teacher about the appropriate number of homework hours that should be assigned to the average eighth grade student per week. The design of the experiment that the student plans to use to test the hypothesis should be reasonable (affordable, appropriate for an eighth grader to accomplish), clearly explained, and possible within the constraints of the scientific process. Did they use any of the techniques for formulating a hypothesis or designing an experiment described in Lesson Plan #1 - Designing Detectives?
2. Another hypothesis is presented, which states: Students who do between 4 and 10 hours of homework per week in mathematics make better grades (a B average or higher). Using the chart of Math Year Average Totals of All Eighth Grade Students at Mystery Falls Middle School, students should notice that the most number of students who received a B or higher did between four and ten hours of math homework per week. There were 136 students who did four and ten hours of homework (per week) compared to 7 students who did 0-3 hours, and 42 students who did 11 + hours. Also, from another perspective, 48 students out of 70 received an A average for the year in math. And 88 students out of 115 students had a year average of B. Both of these amounts (approximately  $48 / 70 = 68.5\%$  and  $88 / 115 = 76.5\%$ ) exceeds 50 % of each group which suggests that the majority of students with a B average or higher did between four and ten hours of homework per week.
3. The statistics that were collected from Mystery Falls Middle School are an example of results from a **Biased Sample** because the only group that is represented is from one location only. In order to be a more representative sample of the average eighth grade student, the sample would have to be of people from other areas of the country or from people other than the students at Mystery Falls Middle School only. If a random sample had been used, each individual would have been chosen entirely by chance (not from a selected school) and each member of the population would have an equal chance of being selected. (Every child in a population would not be selected.) If the statistics represented every fifth, tenth, or thirtieth (etc.) member of the population,

(Scoring Criteria for Summative Assessment #1)

3. (Continued) -

then it would represent a systematic sample. A systematic sample is acquired by selecting one member of the population on a random basis and by choosing additional members at evenly spaced intervals until the desired number for the sample space has been collected. If a stratified sample had been used, the entire population would have been divided into meaningful subgroups (strata) and *then* each group would be randomly sampled (as described by the random sample above).

4. Part A- Using the data set (for the final test of the year) from Ms. Rodriguez's third period pre-algebra class, here is a sketch of the box-and-whisker graph:



Part B- **Mean= 83.71875      Median= 87      Mode= 92**

Part C- A box-and-whisker graph shows the median, quartiles, and range of the data set. By looking at the spread of the data, a box-and-whisker graph helps summarize large amounts of data into an easily read diagram. However, unlike a stem-and-leaf plot, the mean and mode cannot be determined in the diagram.

5. Part A- Approximately 269 students did less than 8 hours of homework per week at Mystery Falls Middle School based on the histogram. Since the intervals are not in units of one, realize that students will not have exactly the same answers.

Part B- The mode would help identify the number of hours that most of the students spent on math homework per week. The mode is 6-7 hours of homework because 140 students (the largest group of students) averaged this length of time.

Part C- Technically, this is a biased sample because it is the method used to create the sample, not the actual make up of the sample itself that defines the bias. The statistics that were collected from Mystery Falls Middle School are an example of results from

Part C Continued –

a **Biased Sample** because the only population that is represented is from one location only. Remember when the method used to acquire a sample creates a sample that is systematically different from the population, you have a biased sample.

6. Systematic sample (by definition)

(Scoring Criteria for Summative Assessment #1)

## Total Points Awarded for Summative Assessment #1

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Student:		
<b># 1</b>	____ out of 10 points	Comments:
<b># 2</b>	____ out of 10 points	Comments:
<b># 3</b>	____ out of 10 points	Comments:
<b># 4 a</b> <b># 4 b</b> <b># 4 c</b>	____ out of 10 points ____ out of 10 points ____ out of 10 points	Comments:
<b># 5 a</b> <b># 5 b</b> <b># 5 c</b>	____ out of 10 points ____ out of 10 points ____ out of 10 points	Comments:
<b># 6</b>	____ out of 10 points	Comments:
<b>TOTAL POINTS:</b>	____ out of 100 points	Comments:

## Summative Assessment #1

**Directions:** Read the information below.

A large part of a student's after-school time is spent doing homework. For instance, let's look at your math class. Your teacher assigns eight to ten hours of homework per week. Teachers believe this much practice time is necessary to make good grades (a B average or higher). Students believe eight to ten hours of their free time is too much and is not necessary to make good grades.

Your math teacher is considering cutting back the amount of homework that she assigns each week. Your job is to provide enough convincing evidence so that she will make this change. You have been asked to show how much time would be sufficient for the average eighth grade student to spend doing math homework per week. (Keep in mind, students must maintain a B average or higher.)

### Detective Diary Final Entry

1. Formulate a hypothesis about how much time an average eighth grade student should spend on homework per week in order to make good grades (a B average or higher) in mathematics. Design an experiment to test this hypothesis.

2. Consider the following hypothesis: Students who do between four and ten hours of homework per week in mathematics make better grades (a B average or higher). Using the information from the chart below, decide if you agree or disagree with this hypothesis.

**Math Year Average Totals of All Eighth Grade Students at  
Mystery Falls M.S.**

Number of hours spent on homework per week in mathematics ↓	Number of students with an A	Number of students with a B	Number of students with a C	Number of students with a D	Number of students with an F	Total number of students
<b>0 - 3 hours</b>	2	5	10	28	24	=69
<b>4 - 10 hours</b>	48	88	80	22	1	=239
<b>11 + hours</b>	20	22	40	0	0	=82
<b>Total number of students</b>	70	115	130	50	25	=390

Assert the reasons **why** you agree with the hypothesis. If you disagree, then explain your position.

<u>THINK</u> <u>SOLVE</u> <u>EXPLAIN</u>
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(Summative Assessment #1)

(Summative Assessment #1)

3. Looking at **Math Year-Average Totals of All Eighth Grade Students at Mystery Falls Middle School** in the chart from question #2, what kind of sampling technique was used to verify the hypothesis? Explain your answer.

THINK  
SOLVE  
EXPLAIN

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4. The following data set represents math scores from the final exam in Ms. Rodriguez's third period pre-algebra class:

99	98	96	95	94	93	92	92	92	92	91
90	89	89	88	87	87	85	83	82	81	80
80	78	75	74	73	70	68	65	62	59	

- a. Using the exam scores in the data set above, sketch a box-and-whisker graph of the data.
- b. Find the mean, median, and mode of the exam scores.  
**Mean**=\_\_\_\_\_ **Median**=\_\_\_\_\_ **Mode**=\_\_\_\_\_
- c. How can a box-and-whisker graph be used to interpret measures of central tendency? Explain your answer.

THINK  
SOLVE  
EXPLAIN

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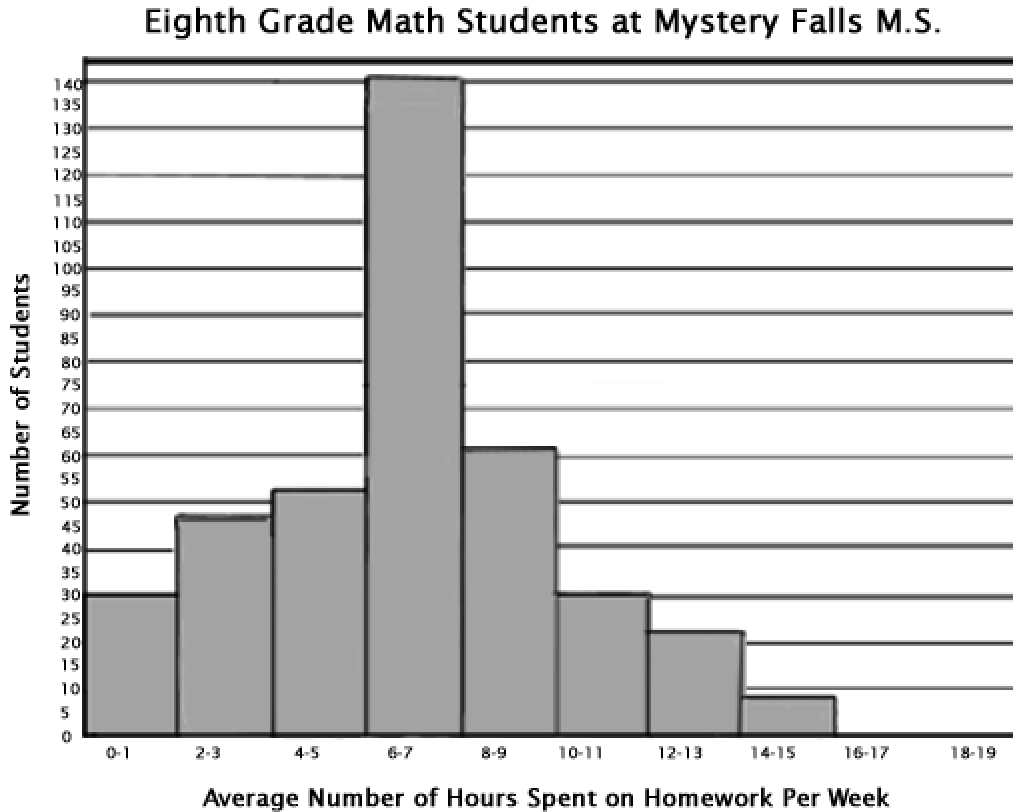
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(Summative Assessment #1)

5. Marie conducted a survey of all 390 eighth grade math students at Mystery Falls Middle School (M.S.) at the end of the school year. She asked them the average number of hours each had spent on math homework per week. Here are the results:



- Approximately how many students did less than eight hours of math homework per week?  
\_\_\_\_\_
- Which measure of central tendency would help identify the number of hours that most of the students spent on math homework per week?  
\_\_\_\_\_
- Do you think the results of this experiment would have been biased if Marie had conducted her survey the second month of school instead of at the end of the year? Explain your answer.

THINK  
SOLVE  
EXPLAIN

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6. Identify the sampling technique being used as stratified, systematic, random, or bias. Then explain **WHY** you believe that particular sampling technique is being used.

Students decide to choose every seventy-fifth listing in the telephone book in New York City, NY.

Sampling technique being used \_\_\_\_\_

Explain your answer. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Summative Assessment #1)